

REMARKS/ARGUMENTS

Upon entry of this Preliminary Amendment into the above-identified Continuation Application, claims 1-15 will be under active consideration in the application.

Applicants have amended Fig. 1 to include the legend -- PRIOR ART -- below the figure number. Applicants have also amended claims 1, 6 and 12, and added new claims 14 and 15 so as to better define patentable aspects of the invention. No new matter has been entered into the application as a result of these changes to the drawings and claims. Claims 1-15 are allowable.

Applicants have discovered that when packaging IGBT integrated circuits, which operate at high electrical potential, it is advantageous to solder the IGBT chips to a ceramic portion of a heat pipe or, a ceramic heat pipe that is located in between the high voltage IGBT chip and a heat sink. Applicant's heat pipe spreads the high heat flux produced by the chip over a relatively larger area, before it is conducted away. This arrangement not only aids in matching the coefficients of thermal expansion between the materials, but also reduces the heat flux, thereby significantly reducing the thermal resistance of the package. This enables higher heat flux operation of the chip, which translates into higher switching rates being possible.

Applicants have amended independent claims 1, 6, 12, and added new claims 14 and 15 to particularly point out that the foregoing advantage is best

achieved by employing an electrically insulating heat pipe with at least two flat sides made of ceramic that are stacked between metallization layers.

In the parent application Serial No. 09/875,231, the Examiner issued a Final Official Action which relied heavily upon U.S. Patent No. 5,446,318, issued to Koike (the "Koike reference"). In particular, the Examiner argued that the Koike reference taught a heat pipe (103). This is simply an inaccurate. Koike teaches a solid heat sink plate (103) that is formed from copper. Such a structure is not a heat pipe, nor would it be considered a heat pipe to one of ordinary skill in the heat transfer arts. Moreover, Koike discloses a semiconductor module in which IGBT chips are stacked upon a solder layer (100), over top of a molybdenum plate (104), which is itself stacked upon a heat sink plate (103). Nowhere within the four corners of the Koike reference does Koike ever teach that the IC device is soldered directly to heat sink structure (103). In fact, Koike teaches that his IC devices are soldered to molybdenum plate (104), which is placed atop heat sink plate (103). Koike utterly fails to teach or suggest in any way an electrically insulating heat sink structure, let alone a heat pipe, having at least two flat ceramic sides and stacked between the electrical insulator and the IC device, and wherein one of the at least two flat ceramic sides is soldered to the IC device. Koike never teaches or suggests that his IC device ever should be soldered directly to his heat sink plate (103) or for that matter that his heat sink (103) is a heat pipe.

Applicants respectfully request that a timely Notice of Allowance be issued in this case.

If a telephone conference would be of assistance in advancing prosecution of the above-identified application, Applicants' undersigned Attorney invites the Examiner to telephone him at 717-237-5516.

Date:

July 14, 2004

Respectfully Submitted,

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